COMPLIANCE INFORMATION

TRANSITION networks

Minneapolis, MN 55344 USA

100BASE-FX Fast Ethernet™
Unmanaged Fiber Hub with TX or FX Uplink
E-FX-HB-1600, E-FX-HB-0800
USER'S GUIDE

The stackable, rack-mountable E-FX-HB-1600 and E-FX-HB-0800 series unmanaged Fast Ethernet™ fiber hubs allow the network administrator to set up and to modify workgroups connected over fiber and to install an optional copper or fiber backbone uplink connection to the workgroups and/or optional connections for stacking up to five hubs.

E-FX-HB-1600, E-FX-HB-1600(SC)

The E-FX-HB-1600 hub provides sixteen (16) Fast Ethernet™ **ST** OR **SC** fiber connections to terminal devices plus space for an optional copper or fiber backbone uplink and space for an optional stacking adapter.

E-FX-HB-0800, E-FX-HB-0800(SC)

The E-FX-HB-0800 hub provides eight (8) Fast Ethernet™ **ST** OR **SC** fiber connections to terminal devices plus space for an optional copper or fiber backbone uplink and space for an optional stacking adapter.

BACKBONE UPLINK ADAPTERS Optional devices ordered separately that, when installed, provide one of the following Fast Ethernet™ backbone uplink connections:

MA-FST	• *ST connector to multimode fiber*
MA-FSC	• *SC connector to multimode fiber*
MA-FSM	• *SC connector to singlemode fiber*
MA-TX	• *RJ-45 connector to twisted-pair copper, AutoCross™ feature*

STACKING ADAPTERS Optional devices ordered separately that, when installed, allow stacking between E-FX-HB-xx00 hubs.

ACC-0200	• *Stacking adapter*
ACC-0201	• *Stacking cable*

E-FX-HB-xx00 IN THE NETWORK

Install one E-FX-HB-xx00 hub and use fiber cable to set up a workgroup by connecting the hub to terminal devices.

to hub, switch, or router
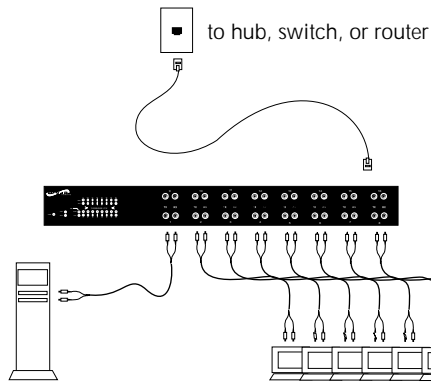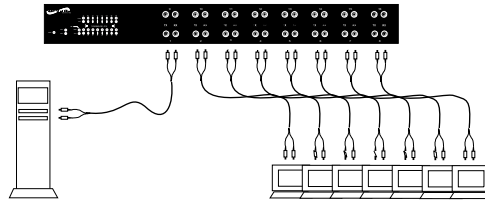
Install an optional backbone uplink adaptor at the back of the hub and use copper or fiber cable to connect the workgroup to a network backbone.

to hub, switch, or router

Install an optional expansion adaptor at the back of up to five (5) hubs and then use expansion adaptor cables to connect the hubs into a stack that functions as one Class A repeater.
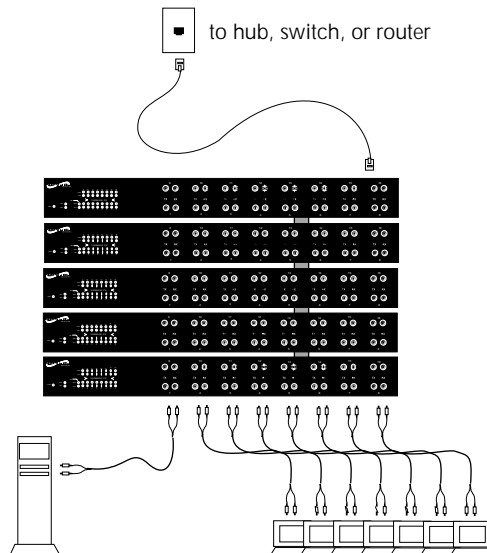
TECHNICAL SPECIFICATIONS

Standards	IEEE 802.3
Dimensions	17.25" x 8.5" x 1.7" (437 mm x 216 mm x 43 mm)
Power	
Input Range:	100 to 240 VAC at 50 or 60 Hz, 3.0 A maximum. Rated at 40 watts maximum.
Environment	Operating Temperature: 0° to 50°C (32° to 122° F)
	Storage Temperature: -15° to 65°C (5° to 149° F)
	Humidity 5% to 95%, non condensing
	Altitude 0 to 10,000 feet
Warranty	Lifetime

CABLE SPECIFICATIONS

Twisted Pair Cable and Connector Specifications

MA-TX   Category 5 twisted-pair copper
Either shielded twisted-pair (STP) or unshielded twisted-pair (UTP) can be used. .

CATEGORY 5:

Gauge	24 to 22 AWG
Attenuation	22.0 dB /100m @ 100 MHz
Maximum Cable Distance*:	100 meters

Twisted pair connection requires two active pairs configured as straight-through OR as crossover. The two active pairs in an Ethernet™ network are pins 1 & 2 and pins 3 & 6. Use only dedicated wire pairs (such as blue/white & white/blue, orange/white & white/orange) for the active pins.

Straight Through   **Crossover**

Twisted Pair #1 1 2 1 2   Twisted Pair #1 1 2 1 2

Twisted Pair #2 3 6 3 6   Twisted Pair #2 3 6 3 6
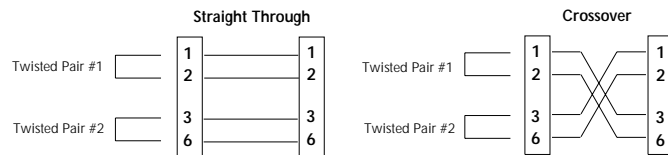
Fiber Cable

MULTIMODE

Fiber Optic Cable Recommended:	62.5 / 125 µm multimode fiber	
Optional:	100 / 140 µm multimode fiber	
	85 / 125 µm multimode fiber	
	50 / 125 µm multimode fiber	
Bit error rate:	$\leq 10^{-11}$	
E-FX-HB-xx00, MA-FST	1300 nM	
Fiber-optic Transmitter Power:	min: -16.0 dBm	max: -9.0 dBm
Fiber-optic Receiver Sensitivity:	min: -35.0 dBm	max: -14.0 dBm
Link Budget	19 dB	
Typical Maximum Cable Distance:*	2 kilometers	
E-FX-HB-xx00(SC), MA-FSC	1300 nM	
Fiber-optic Transmitter Power:	min: -16.0 dBm	max: -9.0 dBm
Fiber-optic Receiver Sensitivity:	min: -35.0 dBm	max: -14.0 dBm
Link Budget	19 dB	
Typical Maximum Cable Distance:*	2 kilometers	

SINGLEMODE

Fiber Optic Cable Recommended:	9 µm singlemode fiber	
Bit error rate:	$\leq 10^{-11}$	
MA-FSM	1300 nM	
Fiber-optic Transmitter Power:	min: -16.0 dBm	max: -9.0 dBm
Fiber-optic Receiver Sensitivity:	min: -35.0 dBm	max: -14.0 dBm
Link Budget	19 dB	
Typical Maximum Cable Distance:*	20 kilometers	

*Actual distance dependent upon physical characteristics of network installation.

▪ to hub, switch or router

Cascade two repeater stacks by connecting fiber cable from a connector at the front of the first hub to a connector at the front of the second hub.
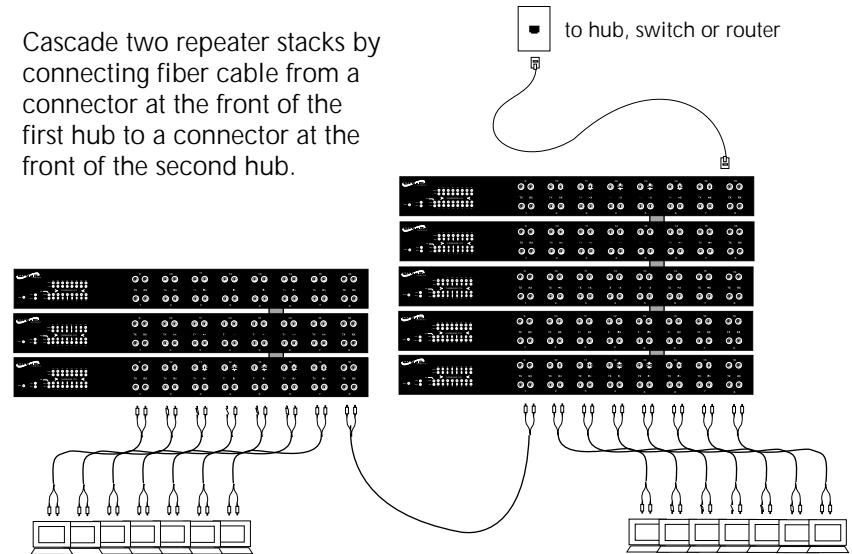
Using the 512-Bit Rule

When configuring Fast Ethernet™ networks, use the 512-bit rule to determine masimum cable lengths for each half-duplex collision domair.

Class I repeater	140 BT
Class II repeater	92 BT
Class I TX/FX media converter	130 BT
Class II TX/FX media converter	92 BT
DTE (PC, switch, router)	50 BT
1 meter CAT.5 TP cable	1.11 BT
1 meter fiber cable	1 BT
Fast Ethernet switch	50 BT

In a half-duplex network, maximum cable lengths are determined by the round trip delay limitations of each Fast Ethernet™ collision domain. (Switches and routers divide the network into separate Ethernet™ collision domains.) The 512-Bit Rule determines maximum distances by calculating the collision domain round-trip delay in bit-times.

To calculate a collision domain round-trip delay in bit-times, find the longest path between any two terminal devices in the collision domain. Calculate the round trip delay by multiplying the length of the cable (in meters) by the delay per meter (in bit-times (BT)), then take the sum of all cable delays plus station (DTE), repeater, and multi-port media converter port delays. If the result is less than or equal to 512 bit-times, the path is good.

30 meters TP @ 1.11BT/meter = 33.3BT

Class I Hub = 140BT

Switch = 50BT

5 meters TP @ 1.11BT/meter = 5.55BT

Class II Hub = 140BT

20 meters TP @ 1.11BT/meter = 22.2BT

Collision Domain
50.00BT
+22.20BT
+140.00BT
+5.55BT
+140.00BT
+33.30BT
+50.00BT

DTE=50BT

= 441.05BT
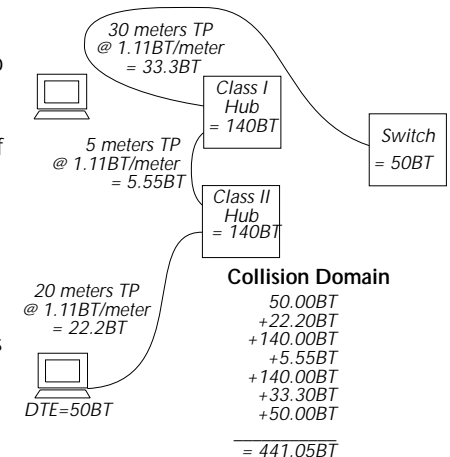
INSTALLATION

Optionally Install Expansion Adapter

WARNING: Remove AC line cord from power source before installing expansion adaptor in E-FX-HB-xx00. Failure to observe this warning could result in personal injury or death.

CAUTION: Wear a grounding device and observe electrostatic discharge precautions when installing Expansion Adapter in the E-FX-HB-xx00. Failure to observe this caution could result in damage to, and subsequent failure of, Expansion Adapter.

To install the expansion adapter in the E-FX-HB-xx00:

1. Locate expansion adapter plate at back of E-FX-HB-xx00.

Expansion Adapter Plate

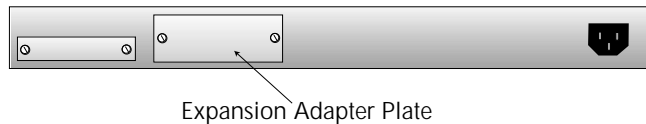2. Remove expansion adapter plate by using flatblade screwdriver to remove two (2) screws that secure expansion adapter plate to back of E-FX-HB-xx00.

   NOTE: Retain screws for step 5. (Optionally discard expansion adapter plate.)

3. Carefully slide expansion adapter, component side up, into installation space revealed by removal of expansion adapter plate.

CAUTION: Do NOT force the connection. Failure to observe this caution could result in equipment damage and subsequent failure.
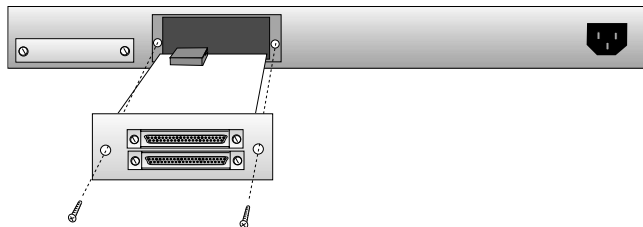
4. Press component on expansion adapter securely against internal mating E-FX-HB-xx00 component until expansion adapter faceplate is flat against E-FX-HB-xx00 chassis.

5. Secure expansion adapter by installing retained screws through expansion adapter into E-FX-HB-xx00 chassis.

YES
- Continue at step 7.

7. **Is one (or more) of the *100BASE-FX STAT(us)* LEDs illuminated continuously?**

   YES
   - Continue at step 10
   NO
   - Continue at step 8.

8. **Does one (or more) of the *100BASE-FX STAT(us)* LEDs blink on and off?**

   YES
   - Check fiber cables for proper connection.
   - Verify that TX and RX cables on E-FX-HB-xx00 are connected to RX and TX ports, respectively, on terminal device. (See page 9.)
   - Ensure that terminal device(s) is/are powered.
   - Contact Technical Support: (800) 260-1312.
   NO
   - Continue at step 9.

9. **Is one (or more) of the *100BASE-FX STAT(us)* LEDs dark?**

   YES
   - The port is (or ports are) partitioned; investigate the attached terminal device(s).
   - Contact Technical Support: (800) 260-1312.
   NO
   - Continue at step 10.

10. **Is one (or more) of the *100BASE-FX ACT(ivity)* LEDs illuminated?**

    YES
    - The port is (or ports are) operational and receiving data.
    NO
    - Disconnect and reconnect the 100BASE-FX cable to restart the initialization process.
    - Restart the terminal device(s) to restart the initialization process.
    - Contact Technical Support: (800) 260-1312.

FAULT ISOLATION and CORRECTION

If the E-FX-HB-xx00 fails, isolate and correct the fault by determining the answers to the following questions and then taking the indicated action:

1. **Is the P(o)W(e)R LED on the E-FX-HB-xx00 illuminated?**

   NO
   - Is the power cord properly installed in the E-FX-HB-xx00 and in the grounded AC outlet?
   - Does the grounded AC outlet provide power?
   - Contact Technical Support: (800) 260-1312.

   YES
   - Continue at step 2.

2. **Is a backbone uplink adapter installed at E-FX-HB-xx00 back?**

   NO
   - Continue at step 7.

   YES
   - Continue at step 3.

3. **Is the *B(ack)B(one) STAT(us)* LED illuminated continuously?**

   YES
   - Continue at step 7.

   NO
   - Continue at step 4.

4. **Does the *B(ack)B(one) STAT(us)* LED blink on and off?**

   YES
   - Ensure that backbone uplink adapter is firmly connected.
   - Check backbone uplink cables for proper cabling and connection(s).
   - Ensure that device at remote end of network link is powered.
   - Contact Technical Support: (800) 260-1312.

   NO
   - Continue at step 5.

5. **Is the *B(ack)B(one) STAT(us)* LED dark?**

   YES
   - The port is partitioned or isolated; investigate the device at the far end of the link.
   - Contact Technical Support: (800) 260-1312.

   NO
   - Continue at step 6.

6. **Is the *B(ack)B(one) ACT(ivity)* LED illuminated?**

   NO
   - Disconnect and reconnect the backbone cable to restart the initialization process.
   - Restart the attached network device to restart the initialization process.
   - Contact Technical Support: (800) 260-1312.

Optionally Install Backbone Uplink Adapter

WARNING: Remove AC line cord from power source before installing backbone uplink adaptor in E-FX-HB-xx00. Failure to observe this warning could result in personal injury or death.

CAUTION: Wear a grounding device and observe electrostatic discharge precautions when installing backbone uplink adaptor in the E-FX-HB-xx00. Failure to observe this caution could result in damage to, and subsequent failure of, backbone uplink adaptor.

To install the backbone uplink adapter in the E-FX-HB-xx00:

1. Locate backbone uplink adapter plate at back of E-FX-HB-xx00.
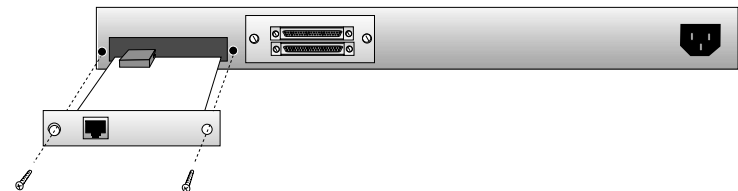
   Backbone Uplink Adapter Plate

2. Remove backbone uplink adapter plate by using flatblade screwdriver to remove two (2) screws that secure backbone uplink adapter plate to back of E-FX-HB-xx00.

   NOTE: Retain screws for step 5. (Optionally discard backbone uplink adapter plate.)

3. Carefully slide backbone uplink adapter, component side up, into installation space revealed by removal of backbone uplink adapter plate.

   CAUTION: Do NOT force connection. Failure to observe this caution could result in equipment damage and subsequent failure.

4. Press component on backbone uplink adapter securely against internal mating E-FX-HB-xx00 component until backbone uplink adapter faceplate is flat against E-FX-HB-xx00 back.

5. Secure backbone uplink adapter by installing retained screws through backbone uplink adapter into E-FX-HB-xx00 chassis back.

Install E-FX-HB-xx00 at Site

WARNING: During the site installation, handle the E-FX-HB-xx00 in such a way that the E-FX-HB-xx00 does not fall. Failure to observe this warning could result in injury to personnel and/or equipment damage.

NOTE: If E-FX-HB-xx00 is shipped with brackets installed, proceed to step 2.

To install the E-FX-HB-xx00 in 19-inch rack cabinet:
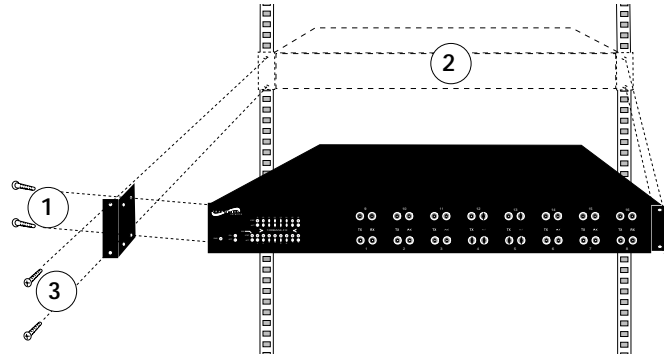
1. Remove and retain two (2) screws located at front left **side** and front right **side** of E-FX-HB-xx00 chassis. Install right and left front brackets (provided) on chassis by installing two (2) retained screws through each bracket into chassis.
2. Carefully align E-FX-HB-xx00 between 19-inch rack mounting rails.
3. Install E-FX-HB-xx00 by installing two (2) screws through right front bracket into rack and two (2) screws through left front bracket into rack, using clip nuts (NOT provided) to secure, if necessary.

To install the E-FX-HB-xx00 on table or other flat surface:
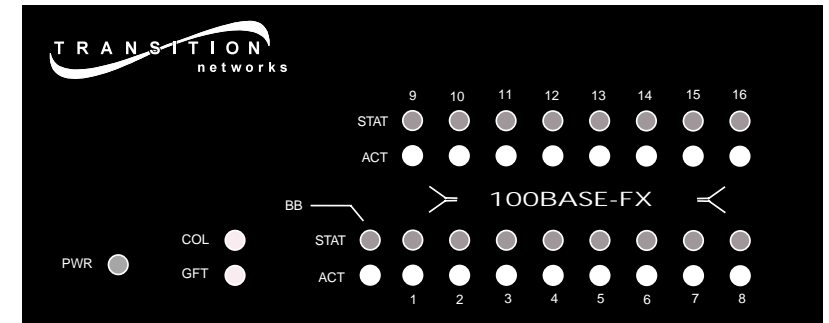
NOTE: Rubber feet are provided.

1. Carefully turn E-FX-HB-xx00 to side.
2. Install four (4) rubber feet:
   - Separate rubber feet.
   - Remove protective paper from adhesive surface on rubber foot.
   - Position and secure each rubber foot as shown.
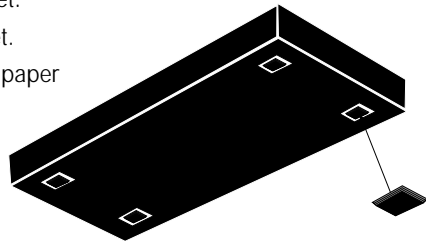
3. Return E-FX-HB-xx00 to upright position.

OPERATION

Use the status LEDs to monitor E-FX-HB-xx00 operation in the network.

HUB INDICATORS

P(o)W(e)R	Steady LED indicates E-FX-HB-xx00 is connected to external AC power.
COL(lision)	Flashing LED indicates network collisions.
G(lobal) F(ault) S(tatus)	Steady LED indicates the presence of a partitioned or isolated port. (A port is partitioned automatically after a collision occurs during 60 or more consecutive attempts to transmit to the port; a port is isolated if more then two consecutive false carrier events are received.)
	NOTE: The hub unpartitions/unisolates the port when network traffic becomes normal. The *GFS* LED remains illuminated until the partition/isolation condition is corrected.)

B(ack)B(one) & 100BASE-FX INDICATORS

|	
STAT(us)	Steady LED indicates, for each port, a valid link and no partition or isolation.
	Dark LED indicates, for each port, that port is not linked, is isolated, or is partitioned.
ACT(ivity)	Flashing LED indicates, for each port, reception of data packet(s).

Power the E-FX-HB-xx00

NOTE: When the hub is connected to an AC outlet supplying 100-240VAC at 50-60 Hz, the hub automatically powers ON

To power ON the E-FX-HB-xx00:
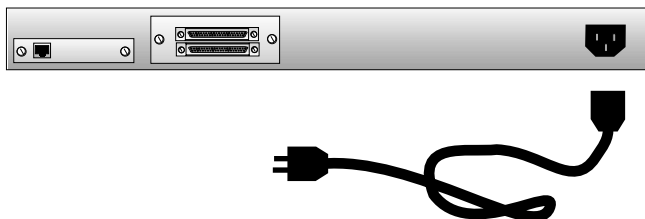
1. Locate power receptacle at back of E-FX-HB-xx00.
2. Plug unit end (female) of power cord into E-FX-HB-xx00 power receptacle.
3. Plug outlet end (male) of power cord into correct voltage AC wall socket.
4. At E-FX-HB-xx00 front, verify that *P(o)W(e)R* LED is illuminated.

Optionally Cascade Hubs

AT BACK

To cascade hubs by installing adapter cable(s) between stacked hubs:

1. Locate uplink adapter installed on E-FX-HB-xx00 9see page 4) and adapter cable ACC-0201.
2. Install one end of adapter cable to UPPER connector on expansion adapter on lowest hub in stack.
3. Install one end of adapter cable to LOWER connector on expansion adapter on next hub in stack.
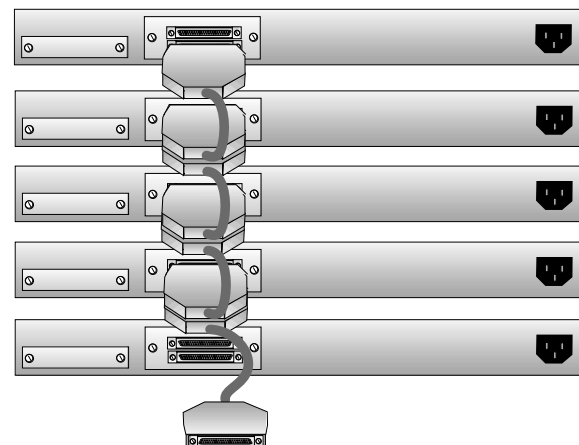
4. Continue steps 2-3 until installation is complete.

AT FRONT

To cascade hubs by installing fiber cables between hubs:
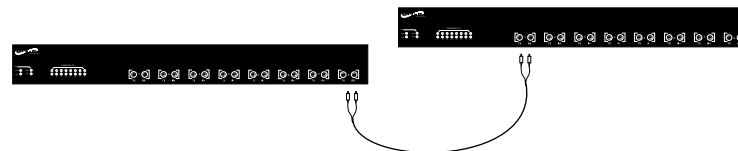
1. Locate or build 100BASE-FX compliant two-stranded fiber cable with appropriate TX to RX connectors installed at both ends.
2. Connect male TX and RX cable connectors at one end of cable to TX and RX female connectors, respectively, on front of one hub.
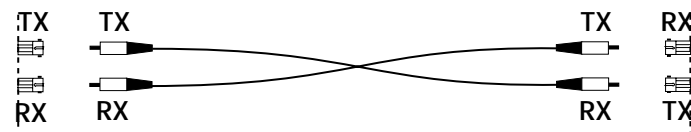
3. Connect male TX and RX cable connectors at other end of cable to RX and TX connectors, respectively, on front of second hub.

Optionally Connect to Backplane through TX Uplink

NOTE: Refer to 512-bit rule (page 3) to keep cable lengths within acceptable bounds.

To connect twisted-pair cable from E-FX-HB-xx00 100BASE-TX uplink adapter to network:

1. Locate 100BASE-TX uplink adapter installed at E-FX-HB-xx00 back. (See page 5.)

   NOTE: *AutoCross™* feature on 100BASE-TX uplink adapter allows use of either straight-through or crossover 100BASE-TX cable configuration.

2. Locate or build 100BASE-TX compliant cables with male RJ-45 plug connectors at both ends. (See page 14.)

3. Connect male RJ-45 plug connector at one end of cable to E-FX-HB-xx00 100BASE-TX uplink adapter RJ-45 jack connector.

4. Connect male RJ-45 plug connector at other end of cable to RJ-45 jack connector on 100BASE-TX network device.

Optionally Connect to Backplane through FX Uplink

NOTE: Refer to 512-bit rule (page 3) to keep cable lengths within acceptable bounds.

To connect fiber cable from E-FX-HB-xx00 100BASE-FX uplink adapter to network:

1. Locate 100BASE-FX uplink adapter installed at E-FX-HB-xx00 back. (See page 5.)

2. Locate or build 100BASE-FX compliant fiber cable with male two-stranded TX to RX connectors at both ends. (See page 14.)

3. Connect male TX and RX cable connectors at one end of cable to TX and RX female connectors, respectively, on E-FX-HB-xx00 100BASE-FX uplink adapter.
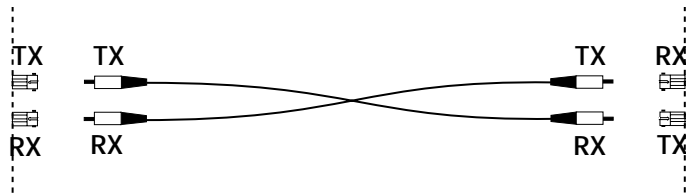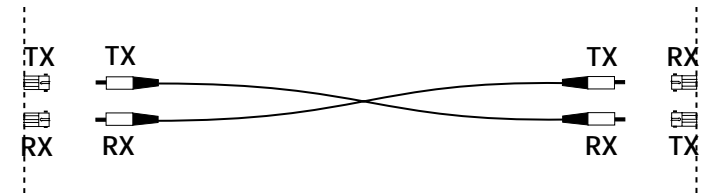

4. Connect male TX and RX cable connectors at other end of cable to RX and TX connectors, respectively, on 802.3 compliant 100BASE-FX network device.

Connect Hub to Terminal Devices using Fiber

NOTE: Refer to 512-bit rule (page 3) to keep cable lengths within acceptable bounds.

To connect fiber cable from E-FX-HB-xx00 ports to terminal devices:

1. Locate or build 100BASE-FX compliant two-stranded fiber cable with appropriate male TX to RX connectors installed at both ends.

2. Connect male TX and RX cable connectors at one end of cable to TX and RX female connectors, respectively, on E-FX-HB-xx00 port.

3. Connect male TX and RX cable connectors at other end of cable to RX and TX connectors, respectively, on 802.3 compliant fiber device.

4. Repeat steps 1-3 until all terminal devices are connected.